Task Force members

Matthew Corrigan: Task Force Lead

Academia & Industry
- Dave Jones
- Zia Alavi
- John D’Angelo
- John Casola
- Norbert Ponweiser
- Andreas Lutz
- Bharath Rajaram
- Codrin Daranga
- Bill Buttlar

State DOTs & FHWA
- David Mensching
- Amir Golalipour
- Joe Devol
- Steve Landers
- Steve Davis
- Al Vasquez
- Tim Ramirez
- Troy Lehigh
- Jay Sengoz

Their efforts for this task force are greatly appreciated.
Outline

• Task Group Objective
• Work Items
• Summary of Activities & Findings
• Future Steps
“This Task Force was created on ground tire rubber- (GTR-) modified asphalt testing standard development with a goal to develop a draft provisional AASHTO standard using the concentric cylinder (cup & bob).”
Work Items

- Verification of Concentric Cylinder
- Draft of Standard
Verification of Concentric Cylinder

• Objective:
  - Validation of geometry factors (CSS & CSR) for concentric cylinder.

• Provided documentation on few established procedures

• Representative from each vendor to work on this item and provide suggestions
Testing Plan

- Provided a polymer modified binder (PG76-22) to all participating labs by UC-Davis

- Frequency Sweep Testing:
  - Test using both concentric cylinder and parallel plates (25-mm) with 1.0 mm gap setting
  - Frequencies ranges from 0.1 to 100 rad/s
  - Strain level: 1%
  - Tests should be performed at 52, 64 and 76 C
  - Master Curve: Compare rheological parameter

- Participating Labs:
  - Anton Paar, TA, UC-Davis, FHWA-ABTL
Analysis Methods

• Sigmoidal model:

\[ \log(|G^*|) = \delta + \frac{\alpha}{1 + e^{\beta + \gamma \log(f_r)}} \]

• Time Temperature superposition (shift factors):
  – Arrhenius model

\[ \log(a_T) = \frac{E}{\ln(10) \times R} \left( \frac{1}{T(\degree K)} - \frac{1}{T_r(\degree K)} \right) \]
Frequency Sweep Test Results: PP vs. CB

*Shifted Data*

- Good agreement between two geometries
- Overall similar results among labs
Frequency Sweep Test Results: CB

*Shifted Data*

[Graph showing complex shear modulus (G*) vs. reduced frequency (Hz) for different labs (Lab 1, Lab 2, Lab 3, Lab 4) with data points marked for each lab.]
Master Curve: CB

Overall similar results among labs
Black Space diagram: CB

- At higher stiffness ranges, similar trend between labs
- At lower stiffness ranges, differences are observed
Comparison of results: PP vs. CB

Frequency sweep raw data

- Percent differences for $G^*$ are between %0.07 to %7.99
- Percent differences for $\delta$ are between %0.01 to %5.69
- Similar results between two geometries across 4 labs
Reproducibility of results: PP vs. CB

Variability between test results of labs
COV% is below 5% for both geometries
PP results show less variability
IV) Draft of Standard

Standard Method of Test for

Determining the Rheological Properties of Asphalt Binder Containing Ground Tire Rubber Particulates Using Concentric Cylinder Geometry in the Dynamic Shear Rheometer (DSR)

AASHTO Designation: TP XX-XX

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001
Topics of Discussion

• Scope:
  – Focus on GTR modified asphalt binder
  – PG High temperature characterization
  – Procedure to calibrate/verify torque and temperature

• Future items:
  – Intermediate temperature testing
  – RTFO aging
  – BBR testing
FHWA Field Support
Mobile Asphalt Testing Trailer (MATT)

• Mobile Asphalt Pavement Materials Lab
  – Site Visits/Conferences
  – Field Data/Testing/Evaluation/Support
  – Use/Demo Emerging Test Devices
  – POC: Matthew Corrigan, Dave Mensching
Thank You!!

FHWA’s Mobile Asphalt Testing Trailer
Office of Asset Management, Pavement, and Construction

www.fhwa.dot.gov/pavement/asphalt